

# Increasing the Yield of Implosion-Type Fission Devices

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## Introduction

According to publicly-available documents, conventional fission implosion devices involve the implosion of a spherical-shaped fuel core by a spherical high-explosive shell consisting of an array of shaped charges. How the problem the tendency toward asymmetry of the blast wave was overcome is not adequately explained in the publicly available literature.

## Abstract

Although an asymmetrical implosion would likely still generate a fission reaction with a spherical fuel core, given that there is no way to prevent an imploding blast wave from taking on a non-spherical geometric configuration, the most likely solution to that problem lies not in changing the configuration of the high-explosive, but rather, changing the configuration of the fuel core as well as the detonator timing.

When a gas is compressed either due to a sudden decrease in its temperature or due to external compression, it tends strongly toward taking on a geometric configuration. Even if all points along a spherical shell of high explosives were ignited at the same instant, a geometric pattern would take form during the implosion, resulting in a reduction in efficiency.

This reduction in efficiency would not have prevented the success of the Trinity Test, but it could have been expected to produce exactly the same sort of comparatively low-intensity explosion seen in the case of both Trinity and Hiroshima. There was little difference between the yield of the implosion- and gun-type designs despite the greater number of neutrons which are produced by plutonium as well as its reduced nuclear stability and increased pressure versus U-235 in a gun-type design. By all rights, the plutonium implosion device should have generated a greater yield than 21kT. I propose that the reason it did not was because of the use of a spherical fuel core rather than a geometric fuel core and because too great an emphasis was placed on synchronized detonation of all of the high-explosive charges.

Although there is no question that early implosion bomb designs utilized a spherical fuel core, it would have made sense for bomb designers to transition from a spherical core shape to a *geometric* core shape. If they did not do this, it ought to be suggested to them that they do this. Although we can't be certain as to the shape of the fuel cores of more modern nuclear devices as these documents remain unavailable to the public, a geometric shape, namely a pentagonal prism, would, in this author's opinion, make a more suitable shape for a fissionable fuel core, particularly given the ability to finely control the initiation of detonation at various points around the exterior of the high-explosive shell.

The most efficient approach to bringing about fissioning would be to utilize a pentagonal prism shape for the fuel core and to couple this with a purposefully offset timing of detonation from seven distinct points around the circumference of the sphere which align with each of the seven facets of the geometrically-shaped core. Each of the side-facets would ideally be made to be offset in timing by a margin of about eight microseconds relative to one another so as to bring about a fluid-like rotation of the fissionable material during its own compression process. Five 'Pillars' of increased fission activity would come about (inset from and parallel with the vertices of the prism) which would become emissive neutron sources as compression continues. Through induced rotation brought on by the offset timing, these columns of neutron emissions would be made to sweep through much of the volume of the core during the fissioning process, triggering fissioning of all materials coming within range of the columns of superheated material.

This rotation would ensure that the fissile material is, as completely as possible, consumed.

The fissionable core in the shape of a pentagonal prism would have the added benefit of reducing the rate of decay of stored fission devices as well as enhancing the effectiveness of tritium-augmentation in enhanced fission devices. Taken a step further and combined with concepts such as the fusion enhancement concept promulgated in 24 July 2024, thermonuclear devices may also be enhanced in their efficiency, allowing for unprecedented miniaturization and yield enhancement.

With a sufficiently miniaturized fission device, experimental proposals such as the 24 July 2024 proposal could be maximized in their practicality. For example, a liquid hydrogen canister in the shape of a pentagonal prism could be situated at the center of seven arrayed fission devices working along the above-described lines. Our best chance to enhance fusion reactions, however, is to trigger, as mentioned in 24 July 2024, a recursive fusion-fission-fusion cycle. This can be best achieved through the creation of a particle vortex sufficiently powerful to hold hydrogen/helium within the focal point for extended periods of time in much the same way that vacuum bombs have enhanced incendiary capacity due to their ability to draw in large amounts of air in order to combust large quantities of napalm which would otherwise remain unreacted without the generation of an atmospheric vortex. Unlike in combustion (except in certain rare cases,) however, fusible materials may, under the right conditions, be repeatedly re-reacted to produce greater amounts of energy.

Tsar Bomba's yield, for example, may not have been the exclusive result of the use of greater amounts of hydrogen, but may have been inadvertently brought about by the accidental creation of a slight rotational induction brought about by detonating the hydrogen canister from two sides simultaneously. If a hydrogen canister in the shape of a pentagonal prism were imploded from seven directions in much the same fashion in which a pentagonal prism of uranium may be detonated according to the aforementioned method and one ensures that an offset timing capable of bringing about rotation is utilized, a fusion-fission-fusion cycle may be initiated which could *dramatically* increase the yield of a device by allowing

for the same hydrogen fuel to recursively fuse over a comparatively lengthy period of time. If a reaction which would ordinarily run its course over 1/10th of a second could be made to repeat itself over a period of three seconds, the result would be a 30-fold increase in yield.

## **Conclusion**

As we seek to modernize our nuclear arsenal and perhaps even to expand it, it would make sense to use the most modern and efficient possible design for any novel thermonuclear weapons.